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November 9, 1992

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
Room 222
1919 M Street, N.W.
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Re: General Docket No. 90-314
ET Docket No. 92-100

Dear Ms. Searcy:

On behalf of SpectraLink Corporation, we are filing an original and five (5) copies of its Comments in the above-referenced proceedings.

If there are any questions, please contact the undersigned counsel.

Respectfully submitted,

FLETCHER, HEALD & HILDRETH

George Petrutsas
Counsel for SpectraLink Corporation

GP:cej
Enclosures

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of	)	
	)	GEN Docket No. 90-314
Amendment of the Commission's	)	ET Docket No. 92-100
Rules to Establish New Personal	)	
Communications Services	)	

COMMENTS OF SPECTRALINK CORPORATION

Thomas Ohlsson
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In the Matter of	)	
	)	GEN Docket No. 90-314
Amendment of the Commission's	)	ET Docket No. 92-100
Rules to Establish New Personal	)	
Communications Services	)	

COMMENTS OF SPECTRALINK CORPORATION

SpectraLink Corporation hereby submits its Comments in response to the Commission's Notice of Proposed Rule Making and Tentative Decision, FCC GEN Docket No. 90-314 and FCC ET Docket No. 92-100, released August 14, 1992, relating to the amendment of the Commission's rules to establish new Personal Communications Services.

SpectraLink Corporation specializes in wireless business communications and has developed a wireless PBX/Centrex adjunct product which augments an organization's existing phone system with wireless phone extensions. The SpectraLink product uses microcell technology and spread spectrum radio transmission in the 902 to 928 MHz bandwidth and operates under Section 15.247 of the Commission's Rules.

SpectraLink has demonstrated that it is possible to develop, within the confines of existing available spectrum, a microcellular system which provides the capacity and coverage necessary to meet the needs of large businesses. In order to do this, SpectraLink has engineered a system which is spectrally efficient, with microcells and handsets that operate at power levels far below the

one watt maximum mandated by Section 15.247 of the Commission's rules. Because SpectraLink has already overcome many of the obstacles associated with in-building wireless technology, it can provide useful comments on the Commission's Notice of Proposed Rulemaking and Tentative Decision in GEN Docket No. 90-314 and in ET Docket No. 92-100.

The allocation of spectrum for in-building unlicensed PCS service is being proposed in order to fulfill user demand for in-house wireless services. These wireless technologies, whether voice or data, are meant to serve the end-user in solving their unique communications problems. In the spirit of offering a functional product, SpectraLink believes that any technical requirements mandated by the Commission should be aimed at providing the end-user with as much flexibility as possible in configuring a communications solution that meets their specific requirement.

SpectraLink supports the Commission's proposal to establish new Personal Communications Services (PCS) and we specifically applaud the Commission's decision to establish rules for both licensed PCS services and unlicensed devices. Because of SpectraLink's current market focus, it is expected that the company will develop products that adhere to the proposed guidelines within this NPRM for unlicensed devices, or User-PCS. Therefore, SpectraLink will limit its comments to those sections devoted to unlicensed devices, specifically paragraphs 41-45 and pages 69-73 of the NPRM.

SpectraLink agrees with the Commission that a substantial number of wireless devices, both voice and data related, will evolve to take advantage of the new frequency allocation proposed by this NPRM. There is little likelihood that two or more systems

will be co-located during the initial implementation of User-PCS, and consequently the deleterious effects of interference between dissimilar systems may not be fully appreciated until much later. As products are developed for User-PCS and market acceptance increases, there is the distinct possibility that two or more dissimilar systems may operate within the same geographical area, with the expected interference causing significant problems. At issue is how to minimize the probability and severity of interference while simultaneously offering a desirable access mechanism for all User-PCS systems.

Voice and Data User Partitioning

The nature of voice communications is such that the demand for media access is unpredictable and the use of media is lengthy. Furthermore, appreciable delays in granting access to a voice-based system are considered undesirable from the user's standpoint. Any interruptions during the actual conversation are unacceptable. In contrast, data communications tends to be predictable and the use of media is short due to the "bursty" nature of data transmission. Delays and interruptions to data transmissions are normal and acceptable, within design constraints of the data system. For example, local area networks such as Ethernet rely on gaps between data packet bursts to insert new data.

Because voice and data transmission requirements are fundamentally different from one another, SpectraLink feels that the channelization proposed by the Commission in paragraph 44, though it adequately serves the various digital access technologies envisioned for User-PCS, is not optimal for the voice user. The interrupt-driven scheme used in data communications would not be tolerable in human conversations. For this reason SpectraLink recommends that voice and data systems should operate in separate

portions of the User-PCS spectrum. Specifically, 10 MHz of the unlicensed device spectrum should be allocated primarily for voice services and the remaining 10 MHz should be allocated primarily to data services. This allows etiquettes to be established for media access that are appropriate for either voice or data systems. However, greater bandwidth access should be permissible if the User-PCS equipment determines that the remainder of the spectrum is not being used.

Channelization

Assuming that the Commission considers a 10 MHz spectrum assignment for voice-based User-PCS equipment, SpectraLink feels that this bandwidth should be further channelized into eight (8) 1.2 MHz frequency assignments, with each frequency assignment bounded by 50 kHz of additional spectrum to serve as a guardband. No system should require more than 10 MHz, or eight 1.2 MHz frequency assignments for nominal operation. Within each 1.2 MHz frequency assignment a system can use any preferred technology; for example, one single TDMA channel using all of the 1.2 MHz or up to 12 FDMA channels of 100 kHz each.

Systems that occupy a full 1.2 MHz frequency assignment should commence a search for an unoccupied slot from one end of the 10 MHz voice allocation. Systems that occupy less than the full 1.2 MHz frequency assignment, such as a narrow-band FDMA system, should commence a search for an unoccupied slot from the other end of the 10 MHz voice allocation. A single system must occupy a minimum amount of any 1.2 MHz frequency assignment before attempting to occupy an additional assignment in an effort to guarantee spectrum efficiency.

Need for Additional Spectrum

While SpectraLink considers a 10 MHz bandwidth adequate to provide an auxiliary wireless service, the Company recommends that greater bandwidth be available for those who require greater capacity. SpectraLink is confident that a wireless PBX product designed to support applications in excess of 400 extensions could provide primary telephone capability with bandwidth in the range of 15-20 MHz. By "primary", SpectraLink means that the wireless telephone would be the single instrument the end-user relies on for all telephone conversations within the user's facility. Conversely, it is SpectraLink's experience that 10 MHz of spectrum will provide an adequate grade of service for an auxiliary telephone instrument. Again, the term "auxiliary" refers to a telephone which is employed only when the user is away from his or her desk.

The 10 MHz segment which SpectraLink proposes to support voice services cannot deliver a true primary wireless telephone system. An indoor, micro-cellular wireless system must contend with the three dimensional nature of radio propagation. This three dimensional characteristic renders traditional cellular frequency reuse patterns ineffective. Therefore, SpectraLink proposes that a User-PCS system should be permitted to operate up to the maximum available bandwidth, that is, 20 MHz, in situations where users require additional service, such as peak busy hour periods. However, such a system may not arbitrarily use the additional spectrum without first monitoring this additional spectrum and determining that another transmission is not detected within the desired band. Furthermore, upon activation of other systems in the nearby vicinity, any system must fall back to a maximum of 10 MHz occupancy if that system were previously using a greater amount of bandwidth.

Peak Power and Power Density

The Commission has specified (NPRM pp. 70 & 71) peak power and power density for the 1910-1920 MHz band as 1 watt and 1.5 mW in any 3 kHz band, respectively. The peak power for the 1920-1925 MHz is specified as 20 mW, while the 1925-1930 MHz band is specified as 100 mW. SpectraLink endorses the approach put forward by the WIN Forum (ref. WIN Forum Working Draft, section 2.B) of a formula of 10E-4*SQRT(B) watts, where B is the occupied bandwidth in hertz. In addition, WIN Forum specifies a power spectral density not to exceed 5*10E-4 watts in any 3 kHz band. This approach results in reasonable power levels for occupied channels ranging from 100 kHz to 10 MHz, without favoring any particular channel bandwidth or technology used within that band. This proposal will limit the peak power in a 100 kHz channel to 32 mW, in a 1.2 MHz channel to 110 mW, and a 10 MHz channel to 316 mW.

Frequency Stability

SpectraLink feels strongly that the frequency stability proposed by the Commission (NPRM pg. 72) at +/- 0.0001 percent is too restrictive and impracticable. The cost to implement this degree of tolerance in a hand-held radio device is prohibitive and the ability to maintain the tolerance over the life of the product is doubtful. Therefore, SpectraLink recommends to the Commission that frequency stability be specified as sufficient to ensure that the fundamental emission stays within the band of operation.

Automatic Spectrum Monitoring

Several schemes have been proposed to automatically monitor the spectrum to be used and prevent operation of the intentional

radiator if another transmission is detected within the desired band of operation. Collectively, these schemes are often referred to as "Listen Before Talk". In order for Listen Before Talk to be most effective, rigorous adherence to channelization, framing, and inter-system synchronization is required. Standard channelization and access schemes must be adhered to in order to detect an active user when energy from that user falls within prescribed boundaries. This approach essentially mandates a Common Air Interface, or standard, to ensure consistent detection prior to transmission. It is SpectraLink's belief that the emerging User-PCS industry is not prepared to define a standard interface at this time.

Therefore, in absence of standard interfaces, Listen Before Talk schemes require a prescribed interval to determine the availability of spectrum. Furthermore, the suggested methods brought forth to date all require periodic interruptions to allow access to new, or queued, intentional radiators.

An issue for voice-based systems is unacceptable delays or interruptions due to Listen Before Talk. Voice systems must have virtually unimpeded access to bandwidth to provide the user with an acceptable grade of service. The imposition of Listen Before Talk rules may be limiting to the product architecture that can be offered.

Spectral Efficiency

SpectraLink agrees with the Commission that there is reason to argue for spectral efficiency of unlicensed devices, however, the relationship specified (NPRM pg. 72) by the Commission favors non-TDMA systems. Rather, SpectraLink favors that the Commission specify a peak power output based on actual bandwidth used, and a maximum power density value.

Adaptive Power Control

If the guidelines for peak power output (10E-4*SQRT(B)) are adhered to, the need for adaptive power control is minimized. SpectraLink has observed that indoor propagation creates severe multipath fading. This phenomenon increases the complexity of implementing handoff algorithms within a cellular environment. Additionally, frequency reuse can be efficiently implemented through techniques such as dynamic channel allocation. Therefore, SpectraLink prefers that adaptive power control not be required.

In conclusion, SpectraLink believes that it is in the best interest of unlicensed User-PCS that the proposed band be allocated equally between voice and data systems, and that these systems not be required to share the available spectrum with a Listen Before Talk etiquette. Furthermore, the voice portion of the spectrum should be divided into a group of eight 1.2 MHz channels. This allows for a large enough number of frequency assignments to offer reasonable capacity for one or more systems located in the same geographic location. The Commission should limit power output to a function of actual bandwidth used, and frequency tolerance should be limited to maintaining the energy within the occupied band.

SpectraLink feels that industry groups such as WIN Forum will provide the necessary direction and technical recommendations to ensure the efficient and practical use of the User-PCS spectrum.

Respectfully submitted,
SPECTRALINK CORPORATION

By: 
Thomas Ohlsson
Product Manager